SECTION 4: EVALUATION OF ALTERNATIVES

Each of the alternatives described in the prior section was evaluated to assess its potential performance and suitability as a high-capacity transit route. The evaluation process was structured to reflect both Albuquerque needs and the FTA New Starts program requirements. Two steps were included in the evaluation: a preliminary evaluation and a detailed evaluation. The two-step approach was used to streamline the evaluation process by the early elimination of alternatives that have a low probability of success. The second step served to evaluate the remaining alternatives in greater detail. A brief description of the evaluation process and important findings are provided in this section of the report.

Both the preliminary and detailed evaluation steps required the use of demographic data including existing and future population and employment, age, income, and race/ethnicity. All demographic data were analyzed using a Geographic Information System (GIS) and included buffers of ⅛, ¼, and ½ mile surrounding each alignment.

Demographic data for the 2000 base year are based on information collected during the 2000 US Census and were obtained from MRCOG or directly from the US Bureau of the Census. Employment data for 2000 and 2025 future-year data were obtained from MRCOG. The 2025 dataset is the official dataset used for transportation planning within the Albuquerque urban area.

For the detailed evaluation phase, a baseline alternative was developed. The Baseline alternative includes the transit operations and facilities that are likely to exist in the forecast year (2025) assuming that neither bus rapid transit nor light rail transit are implemented. It serves as the basis of comparison for all project alternatives and establishes the minimum financial requirements of the transit operator in the forecast year. The baseline alternative was developed by the Albuquerque Transit Department. It identifies the routes, type of service, headways, operating hours, and annual cost for the overall transit system anticipated for the year 2025.

4.1 Preliminary Evaluation

The preliminary assessment considered the potential productivity of each corridor based on employment, population, and other demographic attributes. Corridors that indicate a low productivity (in comparison with the other alternatives) were not advanced for further consideration. The Baseline Alternative was not evaluated at this step in the process as it must be carried forward to the detailed evaluation as a requirement of the alternatives analysis and New Starts processes.

The specific criteria and measures used for the preliminary evaluation included those listed below. For those criteria involving demographic information, data was assembled for the area within one-half mile of the alignment.

- Population density for the year 2000 and 2025.
- Employment density for the year 2000 and 2025.

- Density of employed residents.
- Population in age cohorts conducive to transit ridership, i.e., population age groups from 10 to 17 years and 65 years and older.
- Number of zero-car households.
- Low-income populations.
- Special-status minority populations.
- Multi family housing units.
- The quantity of vacant land.
- Route continuity and access to activity centers within the project area.

To evaluate the performance of alternatives relative to each of the above criteria, the data range for each criterion was divided into tercile groups with the highest tercile assigned a value of 2, the middle tercile a value of 1, and the lowest tercile a value of 0. The rating for each alternative is based on where it places in the tercile rankings. After rating each alternative for the various criteria, the ratings were totaled for each alternative. The objective of this step is to separate the viable alignments from those that do not perform as well. It is not intended to rank alternatives, rather it is used to assess their viability as Rapid Transit Project choices within the parameters set for the project. The evaluation ratings for each of the five alignment alternatives are summarized in Table 7. Density plots that illustrate the various data analyzed for the preliminary analysis are included in Appendix C.

As shown by the rating in Table 7, alignment alternatives 1, 2, and 3, all based on Central Avenue, rate substantially higher than alternatives 4 and 5. Alternatives 4 and 5 rated lower because they do not currently have nor are they expected to develop the same densities that occur along Central Avenue. A summary discussion of the key aspects of each alignment alternative is provided below.

It is important to note that this stage of the evaluation is preliminary and limited to factors that indicate ridership and development potential. It does not include other factors related to costs, benefits, and impacts. For this reason, the findings of the preliminary evaluation were used for screening purposes only and not for the final selection of alternatives that were recommended for more detailed evaluation as part of the environmental impact statement and conceptual engineering phase.

Alignment Alternative 1: Central Avenue/Louisiana Boulevard Alignment

This alignment rated high because it possesses many of the attributes that are conducive to transit ridership and is consistent with local land use and growth policies. It has high employment density and moderately high population density. It also has high numbers of disadvantaged populations and is able to serve these groups effectively. This alternative provides access to 12 activity centers, which is a key objective of the high capacity program. Growth prospects are also positive in both population and employment, which presents good

Table 7: Tercile Ratings of Alternatives Based on Socioeconomic Criteria

Alternative / Criteria	Central / Louisiana		Central / Tramway		Central / San Mateo		Lomas / Louisiana		Lomas / Indian School	
	Number	Tercile	Number	Tercile	Number	Tercile	Number	Tercile	Number	Tercile
2000 Census Data										
Population										
1/8 mile	618	0	766	2	818	2	599	0	613	0
¼ mile	1819	1	2138	2	1994	2	1630	0	1579	0
½ mile	4864	2	5155	2	4510	1	4257	1	3518	0
Employed Residents / mile										
1/8 mile	329	1	392	2	425	2	274	0	333	1
¼ mile	920	1	1045	2	1000	2	737	0	818	0
½ mile	2344	2	2388	2	2105	1	2043	1	1671	0
Employment / mile										
1/8 mile	2293	1	2102	0	2505	1	2890	2	2782	2
¼ mile	3831	1	3132	0	3984	1	4516	2	4190	2
½ mile	7179	2	5289	0	7310	2	6793	2	6463	1
Population 10 to 17 years of age	383	1	483	2	346	0	356	0	314	0
Population age 65 years or older	634	2	628	2	607	2	647	2	519	0
Zero-Car Households	155	2	167	2	138	1	121	0	104	0
Persons Below Poverty	1029	1	1268	2	869	1	684	0	602	0
Population of Minorities	1881	1	2255	2	1634	1	1566	0	1319	0
Multi-family Housing Units	1167	2	1100	2	945	1	791	0	650	0
2025 Projections										
Population	5321	2	5507	2	4947	1	4650	1	3926	0
Employment	8145	2	5916	0	8264	2	8107	2	7761	2
Acres of Vacant Land (Existing)	173.0	0	234.0	2	160.5	0	222.2	2	243.4	
Activity Centers within ½ mile	12	2	12	2	11	2	10	1	7	0
Total Score		**26**		**30**		**25**		**16**		**10**

Notes: All data are in units per mile to normalize tercile ratings.
All data are for the area within one-half mile of the alignment except as otherwise noted.

potential for future transit ridership. Based on its high performance, it is recommended for further consideration.

Alignment Alternative 2: Central Avenue/Tramway Boulevard

Like alternative 1, this alignment combines many of the attributes that are conducive to transit ridership and is consistent with local land use and growth policies. It has relatively high population density and, despite low employment within the corridor, it serves disadvantaged populations very effectively. Alternative 2 is also projected to have relatively high population. This alternative provides good access to 12 activity centers, which is a key objective of the high capacity program. Based on its moderately high performance, it was recommended for further consideration.

Alignment Alternative 3: Central Avenue/San Mateo Boulevard Alignment

The characteristics and performance of this alternative are very similar to alternative 1. Like alternative 1, it has high employment density and moderately high population density. It also has high numbers of disadvantaged populations and provides access to 11 activity centers. Based on its moderately high performance, it was recommended for further consideration.

Alignment Alternative 4: Central Avenue/Lomas Boulevard/Louisiana Boulevard

The relatively low rating of this alternative is due to its lower population and population related densities in proximity to the alignment. However, because of the density of employment, especially within ¼ mile, and its provision of access to activity centers, it could function as an effective commuter route for people living outside the alignment but employed near the alignment. It also scores well for development and redevelopable potential because of the large amount of vacant land along the alignment, in particular the area just west of I-25 and the lands owned by the University of New Mexico between I-25 and University Boulevard. While the population and employment characteristics of this alternative are not as conducive to transit ridership as those for the Central Avenue-based alternatives, it is a distinct alignment alternative to Central Avenue and is a viable alignment. In addition, Lomas Boulevard is a route used by commuters traveling from the northeast portions of the metropolitan area to the UNM and Downtown areas. Consequently, it was recommended for further consideration.

Alignment Alternative 5: Central Avenue/Lomas Blvd./Indian School Road

This option rates substantially lower than the other alternatives in most categories except for employment density. It serves the lowest numbers of population, employed residents, disadvantaged populations, and activity centers. While its future employment growth is comparable to the other alternatives, its overall potential performance is much lower than the other choices. Based on its low performance, it was not advanced for further consideration.

4.2 Detailed Evaluation

The next step in the alternatives analysis process was to conduct a detailed evaluation of the alignment alternatives recommended for further evaluation and evaluation of the rapid transit

technologies. As a first step, the additional data required for the evaluation was generated/compiled and specific evaluation criteria and performance measures were identified. Information on these activities and the findings of the evaluation are discussed in this section.

Data Sources and Methodology

In addition to the previously discussed demographic data used for the preliminary evaluation, the detailed evaluation required the development of additional data and information. These included preliminary ridership projections, operating and capital costs, and concept plans.

Preliminary ridership projections for the overall transit system and the specific alignment/ technology alternatives were prepared as part of the analysis process. A mode-choice model is being developed as part of the RTP. This model, which is based on the EMME2 platform and uses MRCOG data sets, will be capable of estimating transit, premium transit, and other non-single occupant vehicle modes of travel. A preliminary version was used to generate ridership and other metrics that are reported in this document. The model used was calibrated using transit data collected more than a decade ago in 1991, the only currently available data. The model will be recalibrated using transit data that is scheduled to be collected in April of 2003. While ridership forecasts are expected to change when the updated model is used, the projections used here for comparative purposes are adequate for the level of analysis being conducted at this stage of the project. The model is being implemented in coordination with MRCOG and under the review of FTA to assure that it meets their modeling requirements.

Preliminary operating costs were developed for each alignment/technology alternative. Costs were based on the assumed operating characteristics for each technology (see Section 3.1 and Table 6), the number of vehicles needed to serve the expected demand and achieve the desired operating headways, revenue miles, and round trip times. Using these parameters, the annual operating costs for the BRT alternatives range from $3.2 million to $4.0 million depending on the alignment. The LRT alternatives range from $8.1 million to $10.0 million depending on the alignment alternative. The operating costs for each alignment/technology combination are summarized in Table 8, below. It should be noted that the costs shown are very preliminary and will likely change as more detailed information becomes available. Additional information regarding the assumptions used to develop operating costs is provided in Appendix D-1.

Table 8: Approximate Annual Operating Costs

Technology/Alignment	BRT	LRT
Alternative 1: Central Ave./Louisiana Blvd.	$3.3 million	$8.4 million
Alternative 2: Central Ave./Tramway Blvd.	$4.0 million	$10.0 million
Alternative 3: Central Ave./San Mateo Blvd.	$3.2 million	$8.2 million
Alternative 4: Lomas Blvd./Louisiana Blvd.	$3.2 million	$8.1 million

Capital costs were estimated based on the anticipated infrastructure necessary to properly develop and operate the rapid transit technology. Costs are based on 2002 dollars and include the cost of vehicles, fare collection equipment, structures and shelters, maintenance facility upgrades, communication equipment, pavement/foundation surfaces, signalization, utility improvements, right-of-way acquisitions and relocations, agency costs, and design and construction contingencies. Unit prices were developed from current industry contracts, NMSHTD 2002 Average Unit Bid Prices, and other rapid transit projects throughout the West. The capital costs estimates for each alignment/technology combination are summarized in Table 9, below. Because the RTP is in the initial stages of analysis and the variability in the type of system that could be implemented, capital costs are shown in ranges. More detailed information on capital costs is provided in Appendix D-2.

Table 9: Approximate Capital Costs (in millions of $)

Technology/Alignment	BRT	LRT
Alternative 1: Central Ave./Louisiana Blvd.	$157 to $195	$286 to $401
Alternative 2: Central Ave./Tramway Blvd.	$173 to $217	$319 to $434
Alternative 3: Central Ave./San Mateo Blvd.	$156 to $192	$286 to $399
Alternative 4: Lomas Blvd./Louisiana Blvd.	$156 to $192	$281 to $398

The above costs assume implementation of the full length for each alignment. If a shorter length is implemented, the costs will decrease proportionately.

Conceptual drawings of the guideway alignment within the existing street section were developed for each of the alternatives under consideration. Because the objective of the alternatives analysis phase is limited to a comparison of alternatives and preliminary assessment of impacts, the conceptual drawings were limited to plan and profile information specific to a median guideway and the remaining street section and right-of-way. Surface and subsurface utility and drainage data were not assessed. These drawings were used to estimate the effects of the guideway on the existing street section, intersection geometrics, parking, access, and right-of-way.

Evaluation Criteria and Performance Measures

The criteria used for the detailed evaluation of alternatives were based on FTA New Starts program requirements. The New Starts criteria consist of five general categories — mobility improvements, operating efficiencies, cost effectiveness, environmental benefits, and transit supportive land use — with each category encompassing one or more performance measures. In addition to the New Starts criteria, evaluation measures to assess the specific needs and interests of the affected jurisdictions and communities were identified by the project team and added to the list of federal criteria.

The evaluation criteria and performance measures were used to rate and compare each of the alignment/technology alternatives against the other. The relative comparisons were ranked and assigned a numbered rating of 0, 1, or 2. The higher number indicates the better option under each criterion. A final ranking for each alternative was established based on the sum of its individual criteria rankings.

The five evaluation categories and performance measures used for the assessment and the rating system for each are discussed below.

Mobility Improvements

Four criteria were evaluated to assess mobility improvements. These criteria and the measures evaluated to assess each alternative are as follows:

1. Ridership measured as the number of person trips and person miles of travel for each alignment.
2. Number of residents served measured as the number of residents within ½, ¼, and ⅛ mile of each alignment. To assess service to transit dependent groups, the number of residents served was further evaluated to determine the:
   - number of persons with incomes below poverty level within one-half mile of the proposed station locations.
   - service to transit-dependent groups (elderly, youth, and zero-car households) within ½ mile of the alignment.
3. Access to employment measured as the number of jobs within ½, ¼, and ⅛ mile of each alignment.
4. Travel time savings measured as a comparison of total travel times for the overall transit system with and without the various rapid transit alternatives. At the corridor level, average travel times for the local bus routes and rapid transit routes were compared.

Operating Efficiency

Operating efficiency was measured by the change in system-wide operating cost per passenger mile in the forecast year compared to the operating cost of a baseline alternative. This measure, expressed in constant 2001 dollars, reports the operating cost per passenger mile for the entire regional transit system. FTA requires that this measure also be reported by transit mode (e.g., rail, bus) if applicable and available.

Cost-Effectiveness

Three criteria were evaluated to assess cost-effectiveness. These criteria and the measures evaluated to assess each alternative are as follows:

1. Incremental transportation system user benefits measured as the quotient of the incremental cost of the system divided by the system-wide passengers served.
2. Incremental cost per incremental passenger measured as the quotient of the cost of the system divided by the number of new passengers above the baseline system, and the cost of the project per the incremental increase in passenger-miles traveled.
3. Overall cost effectiveness measured as the quotient of the project capital costs divided by the sum of the population and employment served.

Environmental, Community, and Business Effects

The environmental, community, and economic effects and benefits of the project were based on both quantitative and qualitative measures. The measures and the assessment methods were as follows:

1. Air quality and energy effects and benefits were estimated using the change in overall vehicle miles of travel and vehicle hours of travel. As VMT and VHT decreases, it is assumed that vehicular emissions and energy usage decrease as well. This measure is based only on relative differences between the baseline condition and the project alternative.
2. Community effects and benefits were based on a qualitative assessment of the effects that the various alternatives could have on the surrounding neighborhoods. Also, the mobility benefits for transit dependent groups were also considered.
3. Benefits to and effects on businesses were based on changes to on-street parking and access as well as improved accessibility for potential patrons.
4. General environmental effects are based on a qualitative assessment of sensitive environmental and cultural resources within the corridor and a comparison of differences between the alternatives.

Transit Supportive Land Uses

These criteria identify the supporting documentation and quantitative data needed to assess the existing land use, transit supportive land use policies, and future patterns associated with proposed New Starts projects. The measures for this category rely on and discuss readily available materials that have been prepared in conjunction with other studies and analyses (e.g., Albuquerque Graphical Information System, Planned Growth Strategy, Centers and Corridors, etc.) The measures and the assessment methods were as follows:

1. Support of transit oriented development as measured by the number of apartments and condominiums and other mixed use type projects in existence or planned along the alignment.
2. Jobs/Housing Balance as measured by the number of jobs and the number of employed residents within ½ mile of the alignment.
3. Consistency with local land use and growth plans as measured by how well an alignment achieves the objectives of the adopted plans of the local area.
4. Economic development potential as measured by the amount of undeveloped and under developed land within ¼ mile of alignment alternatives. For the purposes of this project, underdeveloped lands are defined as parcels where the value of the land is equal to or greater than the value of buildings and other improvements. Land and improvement values are based on assessed values.

Evaluation Results

The three alternatives and baseline alternative were evaluated using the criteria and measures as described above. The findings of the analysis for each of the major categories and individual performance measures are discussed in the following paragraphs. A summary comparison of the baseline and three build alternatives is provided at the end of this section.

Mobility Improvements

Mobility improvements were evaluated based on ridership, number of residents served, service to transit dependent groups, and access to employment. Ridership was measured as the amount of person trips and person-miles-of-travel. Person trips were estimated for bus ridership, premium transit ridership, and total ridership. Person-miles-of-travel was measured for the same three categories. Table 10 summarizes ridership and person-miles-of-travel for each of the four alternatives evaluated.

Overall system ridership shows a marked increase with the introduction of the rapid transit project. Current transit system boardings number about 32,000 a day. In the future, based on the Baseline Alternative, which enhances bus service on selected routes in key locations, but adds no premium services, daily figures grow to about 44,000. As indicated in Table 10, each of the remaining three alternatives generates more than 73,000 riders a day, an increase of almost 66 % above the Baseline.

Table 10: Comparison of Daily Ridership and Person-Miles-of-Travel

	Ridership			
	Bus	BRT/LRT	Total	Person Miles of Travel
2002 (Existing)	32,382	N.A.	32,382	N.A.
Baseline	43,753	N.A.	43,753	145,398
Alt. 1 Central/Louisiana	61,082	13,054	74,136	209,509
Alt. 2 Central/Tramway	59,777	13,648	73,425	210,790
Alt. 3 Central/San Mateo	59,861	13,421	73,282	214,996
Alt. 4 Central/Lomas/Louisiana	61,281	12,035	73,316	207,788

Note: Ridership projections are for the year 2025 except as noted for the 2002 existing ridership.

Ridership projections for the premium service are similar in magnitude ranging from a low of 12,035 to a high of 13,648, a variance of about 13% between alternatives. It must be noted that the length of the alignments is not equal. Thus, even though Alternative 2 has the highest premium service ridership, it has the lowest average premium ridership per mile.

The increase in bus ridership is attributed to two factors. Population and employment growth within the metropolitan area combined with a larger bus transit system provides a more extensive base to attract transit riders. Moreover, the greater mobility and efficiency provided by the premium transit service has a synergistic effect with the overall transit system and, consequently, attracts additional riders to the overall system.

Similar to the findings for ridership, the comparison of person-miles-of-travel (PMT) indicates similarities between alternatives. More importantly, the projections indicate a substantial amount of the overall transit system PMT being provided by the premium service.

Table 11 summarizes the number of residents served, service to transit dependent groups, and access to employment. The table includes data for the year 2000 and 2025. Because the 2025 data are projections, they are limited to population and employment. The data included in Table 11 are limited to the area with a ½ mile of each alignment. These same metrics were evaluated for ⅛ and ¼ mile buffers but are not included in the table. The full data are included in Appendix E.

Analysis of the 2000 year data shows that alternatives 1 (Central/Louisiana) and 2 (Central/Tramway) include the greatest number of residents and transit-dependent groups (i.e., low-income, elderly, youth, and 0-car households); however, the differences between the alternatives is not substantial (less than 15%). Comparing the number of existing jobs shows greater differences between alternatives with Alternatives 1 (Central/Louisiana) and 3 (Central/San Mateo) having the most employment. This difference is important as access to employment is a critical factor in attracting ridership for premium transit service.

Comparison of the data for year 2000 with year 2025 indicates that the projected population and employment growth within the study corridor is modest. As was the case for 2000, alternatives 1 (Central/Louisiana) and 2 (Central/Tramway) have the most residents. The difference in employment continues with Alternatives 1 (Central/Louisiana), 3 (Central/San Mateo), and 4 (Central/Lomas/Louisiana) projected to have a substantially greater number of jobs than Alternative 2 (Central/Tramway).

Table 11: Comparison of Population and Employment Characteristics[1]

Alternative/Measure	1. Central / Louisiana	2. Central / Tramway	3. Central / San Mateo	4. Central/ Lomas/Louisiana
2000 Year				
Number of residents	4,864	5,155	4,510	4,257
Number of persons below poverty	1,029	1,268	869	684
Persons over age 64 and between 10 and 17 years	1,014	1,112	956	1,007
Number of households without a car	155	167	138	121
Number of jobs	7,179	5,289	7,310	6,793
2025 Year				
Number of residents	5,321	5,507	4,947	4,650
Number of jobs	8,145	5,916	8,264	8,107

1. Data is average per mile for buffer within ½ mile of alignments

The estimate of mobility improvements also considered travel time savings. Travel time for the transit system was estimated for each of the alternatives, including the baseline, the findings of which are shown in Table 12 on the following page.

Table 12: Comparison of Daily Vehicle Hours of Travel					
	Baseline	1. Central / Louisiana	2. Central / Tramway	3. Central / San Mateo	4. Central/ Lomas/Louisiana
Regional Hours of Travel	1,039,156	1,027,065	1,026,958	1,027,022	1,028,263

Operating Efficiency

As shown in Table 13, the comparison of system costs for the four alternatives shows that Alternative 1 performs best though there are only small differences among them. In contrast to the Baseline Alternative, the other options are substantially higher on a per passenger cost basis (which is reasonable), but Alternative 1 generates the highest efficiency of the three by a small margin.

Cost Effectiveness

Cost effectiveness demonstrates the incremental cost per incremental passenger in the 2025 forecast year. The annual cost of the project (annualized capital cost and annual operating costs) is divided by the forecast change in annual ridership. These figures are comparable to similar calculations for other systems in the west. The results of the cost-effectiveness evaluation are summarized in Table 14.

Environmental, Community, and Business Effects

The environmental, community, and economic effects and benefits of the project included air quality and energy benefits, community and business effects, and general environmental effects. The evaluation of effects included direct effects (i.e., physical impacts associated with project implementation) and indirect effects (i.e., secondary effects that result from project operation). Direct effects were assessed based on the typical section footprint and alignment. Indirect effects were based on the operating characteristics of each alternative/technology.

Air Quality and Energy

Air quality and energy benefits are an indirect effect of project implementation that result from the shift from automobile travel to transit. Air quality is also affected by traffic flow changes on the street system; however, these effects are generally evaluated as part of an environmental impact statement when project details have been determined.

For the comparison of alternatives, the air quality and energy effects were assessed using vehicle miles and hours of travel, based on the assumption that system-wide changes in VMT and VHT are correlated to vehicular emissions. All of the alternative technologies under consideration would operate using CNG, low-emission diesel, or electric propulsion systems. These fuel sources have lower emissions of the pollutants of concern to Albuquerque when compared to standard gasoline or diesel-fueled vehicles. Consequently, any shift from automobile travel to premium transit would reduce vehicular emissions.

Table 13: System Operating Efficiency

Alternative	Technology	Annual Operating Cost	Annual Transit Passengers	Total System Cost per Passenger	Annual Incremental Operating Cost	Annual Incremental Transit Passengers	Incremental Cost per Incremental Passenger
Baseline	Bus only	$20.5M	12.6M	$1.63	$0	N/A	N/A
Alt 1 (Louisiana)	LRT	$38.5M	21.4M	$1.80	$18.0M	8.8M	$2.05
	BRT	$32.8M		$1.54	$12.3M		$1.40
Alt 2 (Tramway)	LRT	$38.3M	21.1M	$1.81	$17.7M	8.5M	$2.08
	BRT	$32.7M		$1.55	$12.1M		$1.42
Alt 3 (San Mateo)	LRT	$40.8M	21.2M	$1.93	$20.2M	8.6M	$2.36
	BRT	$34.0M		$1.60	$13.4M		$1.57
Alt 4 (Lomas)	LRT	$39.4M	21.1M	$1.86	$18.8M	8.5M	$2.21
	BRT	$33.9M		$1.60	$13.3M		$1.56

Table 14: Comparison of Cost Effectiveness (Capital plus Operating)

Alternative	Technology	Option	Total Annualized Cost	Annual Passengers	Annualized Incremental Cost	Annual Incremental Passengers (New System - Baseline)	Incremental Total Cost per Incremental Passenger
Baseline	Bus only		$20.5M	12.6M	N/A	0	0
Alt 1 (Louisiana)	LRT	High	$71.8M	21.4M	$51.2M	8.8M	$5.85
		Low	$62.2M		$41.7M		$4.76
	BRT	High	$49.0M		$28.5M		$3.25
		Low	$45.9M		$25.3M		$2.89
Alt 2 (Tramway)	LRT	High	$71.4M	21.1M	$50.8M	8.5M	$5.97
		Low	$62.0		$41.4M		$4.87
	BRT	High	$48.6M		$28.0M		$3.29
		Low	$45.6M		$25.1M		$2.94
Alt 3 (San Mateo)	LRT	High	$76.8M	21.2M	$56.3M	8.6M	$6.57
		Low	$67.3M		$46.7M		$5.46
	BRT	High	$52.0M		$31.4M		$3.67
		Low	$48.3M		$27.8M		$3.25
Alt 4 (Lomas)	LRT	High	$72.4M	21.1M	$51.9M	8.5M	$6.08
		Low	$63.5M		$43.0M		$5.04
	BRT	High	$49.8M		$29.3M		$3.43
		Low	$46.8M		$26.3M		$3.08

Table 15 summarizes the system-wide changes in VMT, VHT, and average travel speed for each alternative as compared to the baseline alternative. Because the assessment reflects system-wide changes over a large area, the changes are very small. However, the numbers are not insignificant when considered from the perspective of the regional emissions budget that Bernalillo County must achieve to meet federal air quality conformity requirements. As shown in Table 15, all the alternatives perform similar with respect to VMT and VHT. Travel speed is also similar for all alternatives.

Detailed information regarding changes to emissions, travel speed, and vehicle-miles-of-travel at the system and corridor level will be developed as part of the draft environmental impact statement when additional project details are known.

Table 15: Comparison of System-wide VMT and VHT (all modes)

	Baseline	1. Central / Louisiana	2. Central / Tramway	3. Central / San Mateo	4. Central/ Lomas/Louisiana
Vehicle Miles of Travel	28,723,232	28,630,540	28,627,038	28,630,500	28,630,190
Vehicle Hours of Travel	1,039,156	1,027,065	1,026,958	1,027,022	1,028,263
Speed (mph)	27.54	27.73	27.73	27.74	27.71

Community and Business Effects

The evaluation of community and business effects and benefits considered both indirect and direct effects. Indirect effects include improved service to transit-dependent populations and populations afforded special consideration by Executive Order 12898 (Environmental Justice) and improved access to employment. Direct effects include physical impacts associated with the implementation of a guideway system and associated construction and right-of-way acquisition.

The evaluation of benefits to transit-dependent and special status populations was based on the existing (year 2000) demographic characteristics of the corridor. The factors evaluated included: population between the ages of 10 and 17 and over age 64, the number of households without cars, and special-status minority populations. Because the alternative alignments are not the same length, the data for each metric being evaluated was totaled for the area within ½ mile of the alignments and then divided by the length of each route. This method results in an average value that can be used for comparison purposes.

Locations where the population of transit-dependent groups and minorities is higher than the city-wide average are shown in Figure 6. The results of the evaluation are shown in Table 16. Comparison of the findings for each alternative indicates that Alternative 2 provides the greatest potential service to transit-dependent and minority populations but the lowest service for access to employment.

Table 16: Transit-Dependent and Special Status Populations

Alternative/Measure	1. Central / Louisiana	2. Central / Tramway	3. Central / San Mateo	4. Central/ Lomas/Louisiana
Number of persons below poverty	1,029	1,268	869	684
Persons over age 64 and between 10 and 17 years	1,014	1,112	956	1,007
Minority population	1,881	2,255	1,634	1,566
Zero-car households	155	167	138	121
Number of jobs	7,179	5,289	7,310	6,793

1. All data are for the year 2000 and represent the average per mile for the area within ½ mile of the alignments.

All the alignment alternatives follow existing arterial streets. The addition of a guideway on these street sections could have several direct effects on the residences and businesses adjacent to the alignment. These effects include the loss of mixed-flow traffic lanes, the loss of on-street parking, and the loss of left-turn access to individual driveways. In addition, buildings immediately adjacent to the alignment could be acquired where additional right-of-way is needed for the guideway and/or transit stations.

A preliminary assessment of the existing street system was conducted to identify locations where the narrow street width and right-of-way availability could limit the implementation of a guideway system. Locations with the greatest width limitations include:

- Lomas Boulevard from Central Avenue to Broadway Boulevard
- Central Avenue from 8th street to Locust Street
- Indian School Road from San Mateo Boulevard to Louisiana Boulevard

One other challenging location is the grade-separated intersection of Central Avenue and the BNSF rail line. The structure at this location includes a center pier that separates the eastbound and westbound traffic lanes. Using a 12-foot width on each side of the pier for a BRT or LRT guideway would leave 10 feet or less for use by other vehicles. Because the affected segments of Central Avenue are common to all three alternatives, this condition is common to all alternatives.

If the street section cannot be widened in these locations, it may be feasible to operate bus or light rail transit vehicles in mixed flow lanes. While this would not be a desirable condition and would affect operating speeds, the relatively short lengths where this condition may be needed is unlikely to substantially hinder the overall efficiency of the system. Route alternatives may also be possible, especially through the Downtown area where a one-way system could be implemented with one direction on Central Avenue and the other on either Gold Avenue or Copper Avenue. This option will be evaluated as part of the subsequent phases of the RTP.

The businesses and residential areas adjacent to the alignments could be affected by the loss of on-street parking and elimination of left-turns. While on-street parking is allowed along much of Central Avenue, the greatest concentration and use of on-street parking is on the segments of Central Avenue in the Downtown, UNM, and Nob Hill areas. The elimination of on-street parking would require replacement parking consisting of either parking lots or structures. The location and amount of on-street parking that would be affected will be determined in the next phase of the RTP.

The operation of LRT or BRT service in a guideway system could also affect left-turn access into and from driveways and side streets. Development along much of Central Avenue, Lomas Boulevard, and San Mateo Boulevard is served by driveways to individual parcels. In addition, numerous side streets intersect with these roadways. While right-turns would not be affected, the implementation of a fixed guideway system would likely result in the elimination of left turns at numerous locations. The location and number of driveways and side streets that would be affected will be determined in the next phase of the RTP.

Implementation of a guideway system could also affect several bridge structures due to width and/or weight limitations. These include the river crossing on Central Avenue, the previously mentioned BNSF crossing west of 1st Street in Downtown, and the crossing of Interstate 40 at San Mateo, San Pedro, or Louisiana, depending on which alignment is followed.

General Environmental Effects

Because preliminary design data have not yet been developed, the evaluation of impacts to environmental and community resources was limited to a review of major factors that could affect project implementation. Field reconnaissance and a review of records indicate several factors could have a bearing on project implementation, several of which were discussed in the preceding paragraphs. These include park properties that qualify for protection under Section 4(f) of the US DOT regulations, cultural properties protected by Section 106 of the Historic Preservation Act, and properties contaminated with hazardous materials.

Parks and historic districts/buildings adjacent to the alignment alternatives are illustrated in Figure 10. As shown in this figure, all of the alternatives pass through two historic districts and are in close proximity to two other historic districts. The alignments are also proximate to numerous buildings listed on the National Register of Historic Places. Potential impacts to parks are also very similar for all three alternatives. Alternative 1 may affect three parks whereas alternatives 2 and 3 may affect two parks. While the parks and historic properties are present in all three alternatives, whether these properties would be directly affected cannot be determined until final alignment and section data is developed during preliminary design.

Figure 11 illustrates the approximate location of known properties with leaking underground storage tanks and other potential contamination. As illustrated by this figure, there are numerous sites within the project area with potential impairment by hazardous materials. As was the case for parks and historic properties, the actual effect of these sites on the project

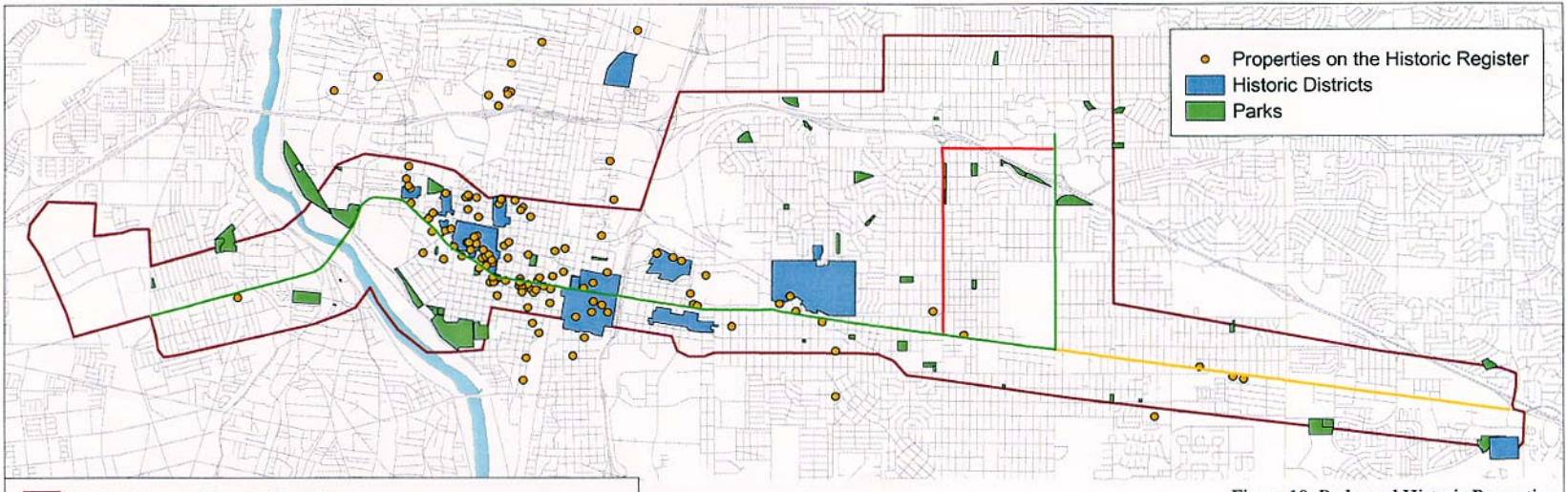

Figure 10: Parks and Historic Properties

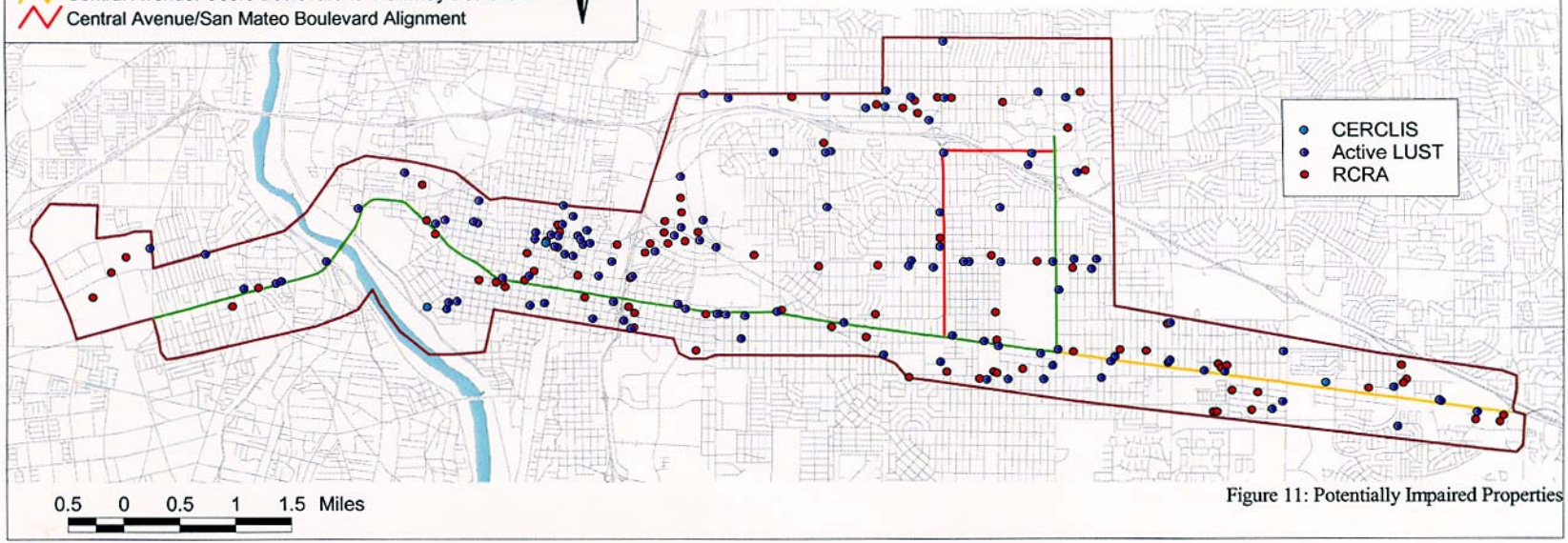

Figure 11: Potentially Impaired Properties

cannot be determined until further design details are developed. However, based on the number and general location of sites, hazardous materials contamination will likely affect the acquisition of right-of-way and project construction.

Transit Supportive Land Uses

The ability for the alternatives to support transit was evaluated based on four factors: (1) the number of existing transit oriented developments near each alignment as measured by the number of existing multi-family dwellings; (2) the number of jobs and employed residents within ½ mile of each alignment; (3) economic development potential as measured by the amount of undeveloped or underdeveloped land within ¼ mile of each alignment; and (4) consistency with local land use and growth plans. The findings for each of these factors are summarized in Table 17 and, except for employment, are discussed below. Employment was discussed under mobility and accessibility benefits.

All of the alternatives serve a relatively high number of multi-family housing units (see Table 17). For this measure, Alternative 1 has the highest density of multi-family housing with almost 1,200 units per mile. Alternative 2 also has a high density with about 1,100 multi-family dwellings per mile. The density of multi-family housing for Alternative 3 is about 950 units per mile — a value approximately 25% less than Alternative 1.

Table 17: Comparison of Transit-Oriented Development Opportunities

Alternative/Measure	1. Central / Louisiana	2. Central / Tramway	3. Central / San Mateo	4. Central/ Lomas/Louisiana
Multi-family Housing Units within ½ mi.	1,167	1,100	945	791
Jobs within ½ mile (2000 yr.)	7,179	5,289	7,310	6,793
Jobs within ½ mile (2025 yr.)	8,145	5,916	8,264	8,107
Number of Employed Residents within ½ mi.	2,344	2,388	2,105	2,043
Vacant Parcels within ¼ mile (acres)	173	234	161	222
Underdeveloped Parcels within ¼ mile (acres)	818	1,168	522	843

Note: Except for vacant and underdeveloped parcels, all data are reported on an average per mile.

The opportunity for economic development or redevelopment for transit supportive land uses was evaluated using the amount of vacant and underdeveloped parcels within ¼ mile of each alignment alternative. For the purposes of this evaluation, underdeveloped parcels were defined as those having a land value to improvement value ratio of 1.0 or greater. The value of the land and improvements was obtained from the Bernalillo County Assessor's office and based on appraised values. As shown in Table 17, Alternative 2 has the greatest amount of vacant and underdeveloped properties. With this alternative, there is over 1,400 acres of land available for development with transit-supportive uses. Alternative 1 also has a significant amount with

almost 991 acres available. Alternative 3 has the least amount with less than 700 acres available for development. In addition, Alternative 3 has a linear park along the east side of San Mateo Boulevard that could preclude redevelopment for several blocks south of Indian School Road. Maps that illustrate the location of vacant and underdeveloped parcels are included in Appendix F.

As discussed in Section 4.1, all of the alignments are consistent with the local land use and growth policies including the Albuquerque/Bernalillo County Comprehensive Plan (and the Centers and Corridors concept contained therein) and the recently adopted Albuquerque City Council ordinance for the Planned Growth Strategy. Both of these policy documents emphasize infill development and a more compact urban form. The plans also emphasize greater use of transit as a mechanism to promote higher density development on Central Avenue, Louisiana Boulevard, and San Mateo Boulevard.

The two technologies being considered by the RTP will have different abilities to affect where and how development and redevelopment occurs. It has been demonstrated that light rail can positively influence development and redevelopment (*TCRP Synthesis 20, Transit-Focused Development, 1997*). Because BRT systems are a relatively new application, it is currently unknown if BRT has the same positive effect on development.